



National Aeronautics and  
Space Administration

**BRIEFING NUMBER 3 TO  
SPACE STATION OPERATIONS TASK FORCE  
OVERSIGHT COMMITTEE**

**DR. PETER LYMAN  
CO-CHAIRMAN**

**CARL SHELLEY  
CO-CHAIRMAN**

**JANUARY 28, 1987**

*Barley*

## **AGENDA**

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- 1. Agenda**
- 2. Review of Oversight Briefing #2**
  - STS/SS Activity
  - NASA/DoD Activity
- 3. OTF Activity Status/Summary**
  - Industry Briefing Results
  - RFP Review Results
  - Cost Assessment Results
  - Operations Concept Development - PRELIMINARY!
- 4. OTF Future Activity**
  - International Meetings
  - Headquarters Reorganization
  - TFSUSS Review
  - Schedule

**REVIEW OF  
OVERSIGHT COMMITTEE  
BRIEFING #2  
ISSUES AND GUIDANCE**

## ISSUES AND GUIDANCE

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- **OPERATIONS ARCHITECTURE**

No specific guidance was provided to the OTF on this issue

- **INTERNATIONAL NEGOTIATIONS PRIOR TO OPERATIONS CONCEPT ESTABLISHMENT**

Space Station International negotiations have been delayed until February. It was agreed that, during the intervening period, the OTF should continue to discuss operations concepts with international partners. However, during this period, the OTF should not make or imply any NASA commitments to the International Partners

- **PHASE C/D RFP RELEASE PRIOR TO OPERATIONS CONCEPT ESTABLISHMENT**

The Oversight Committee Chairman agreed to ensure that a specific response is provided to each OTF review comment on the C/D RFP prior to RFP release

## ISSUES AND GUIDANCE (Continued)

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- **U.S. PAYLOAD SELECTION/PRIORITY RESPONSIBILITY**

The OTF should assume that Code S will have responsibility for selection of U.S. payloads for Space Station. the OTF should continue to develop options for implementation based on this approach

A broader issue related to DoD users was discussed. At the present time, no unique DoD user requirements have been identified. Consequently, OTF should not specifically consider DoD users in its activity.

Several members of the Oversight Committee were concerned that Space Station accommodation of DoD users has not been adequately addressed

### Action

Mr. Stofan will set up a separate meeting with Dr. Cook to address issues associated with accommodating potential DoD users. Major Paul Heartquist (Code S/DoD liaison) has responsibility for coordinating this action.

## **ISSUES AND GUIDANCE (Continued)**

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- **SUPPORT OF COMMERCIAL USERS**

The OTF is not responsible for developing a policy for commercial users. However, operations concepts developed by OTF should not preclude commercial production activities

- **USER COMMERCIAL SERVICES**

Privatization should not be considered as a driver in OTF concept development

- **STS SYNERGISM**

The OTF should address synergistic operations as an option

## ISSUES AND GUIDANCE (Continued)

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- **TRANSPORTATION TO/FROM SPACE STATION**

A greater degree of coordination must be established between Codes M and S. Admiral Truly noted that he would like to ensure that Space Station related activities in Code M will, in fact, be useful to Space Station

**Action**

Mr. Stofan will set up meeting(s) with Admiral Truly to review areas of common interest in Space Station. Mr. Dan Herman (Code S) has the responsibility to develop a list of areas of Code S/Code M common interest and set up the required coordination meetings

- **CREW RESCUE VEHICLE**

No specific guidance was provided pending the report of the CERV task team

# SSOTF CURRENT ACTIVITY





SPACE STATION  
OPERATIONS  
TASK FORCE

## INDUSTRY BRIEFINGS SUMMARY

9 companies

### TRW

- Crew, automation, and ground partitioning
- Cost controls and management
- User integration simplification
- User selection and manifesting
- Proprietary operations
- Centralized or distributed integration
- Universal test and checkout procedures

### LOCKHEED

- Ground operations
- Air Force satellite control facility
- Space telescope, Milstar and classified programs

{ poor presentation }

## **INDUSTRY BRIEFINGS SUMMARY (Continued)**

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### **ROCKWELL**

- STS lessons learned
- Cost modeling
- Payload manifesting
- ENRO Technical Exchange Agreement and Spacelab D-1 lessons learned

### **McDONNELL DOUGLAS**

- Computer-aided user and operational integration/phase B results
- International operations integration
- operability assurance for Space Station design
- Cost-effective implementation meetings
- Required functional allocations
- Efficient use of operations resources
- Applicable lessons learned

**BOEING**

- Integrated logistics support program techniques
- Sustaining engineering
- Design for future operations
- Spares support

**GENERAL ELECTRIC**

- Growth and evolution of the Station
- Mission mix and selection
- Payload operations support

**UNITED AIRLINES**

- Logistic services
- Sustaining engineering
- Marketing approach
- Training

**BALL AEROSPACE**

- Payload operations and accommodations

**IBM**

- Data management system/hardware
- Shuttle primary avionics software

**CSC**

- Space Station operations environmental factors
- Shuttle Re-supply activities
- Operations scenarios
- Important Space Station operations factors and issues
- Skylab lessons learned

**BOEING**

- Marketing outreach contract with Office of Commercial Programs

# PROGRAM PHASE C/D RFP REVIEW PROCESS

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## DRAFT RFP'S

11/13/86	Strawman review process
11/24/86	Criteria and schedule defined
12/1/86	Start
12/8/86	Team comments discussed with panel leaders
12/10/86	Issues defined by co-chairmen and panel leaders
12/17/86	Issues presented to AA for Space Station
12/18/86	Comments submitted to Code SEG
12/24/86	Comments sent to RFP managers

## REVISED RFP's

1/21/87	Start
1/23/87	Comments to Code SEG
1/27/87	HQS comments data faxed to SEB chairpersons
1/29-30/87	Modifications by centers
2/2/87	Oversight presentation to HQS procurement/verbal approval
2/3-4/87	RFP release

# SUMMARY REVIEW OF DRAFT RFP'S

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- Issues
  - Operations roles and missions
  - Program Support Contractor role
  - Life cycle costs
  - Logistics
  - Integrated transition planning
  - Automation and robotics planning
  - Second item purchase
  - Concept verification
  - Interactive information system assessment
  - Deliverables definition
  - Data requirements
- Recommendations
  - Redraft the RFP's
  - Complete an internal NASA review before releasing the RFP's to the potential bidders
- Comments
  - About 100 submitted

## **SUMMARY REVIEW RFP'S**

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- The draft RFP's were much improved. There is no need for major modification
- About 60 percent of SSOTF comments on the draft RFP's were incorporated
- Comments resubmitted related to
  - Life cycle costs
  - Logistics\*
  - Data requirements

\* Program approved logistics process requirements at 1/15/87 SSCB; should satisfy most of comment

## **COST ASSESSMENT SUMMARY**

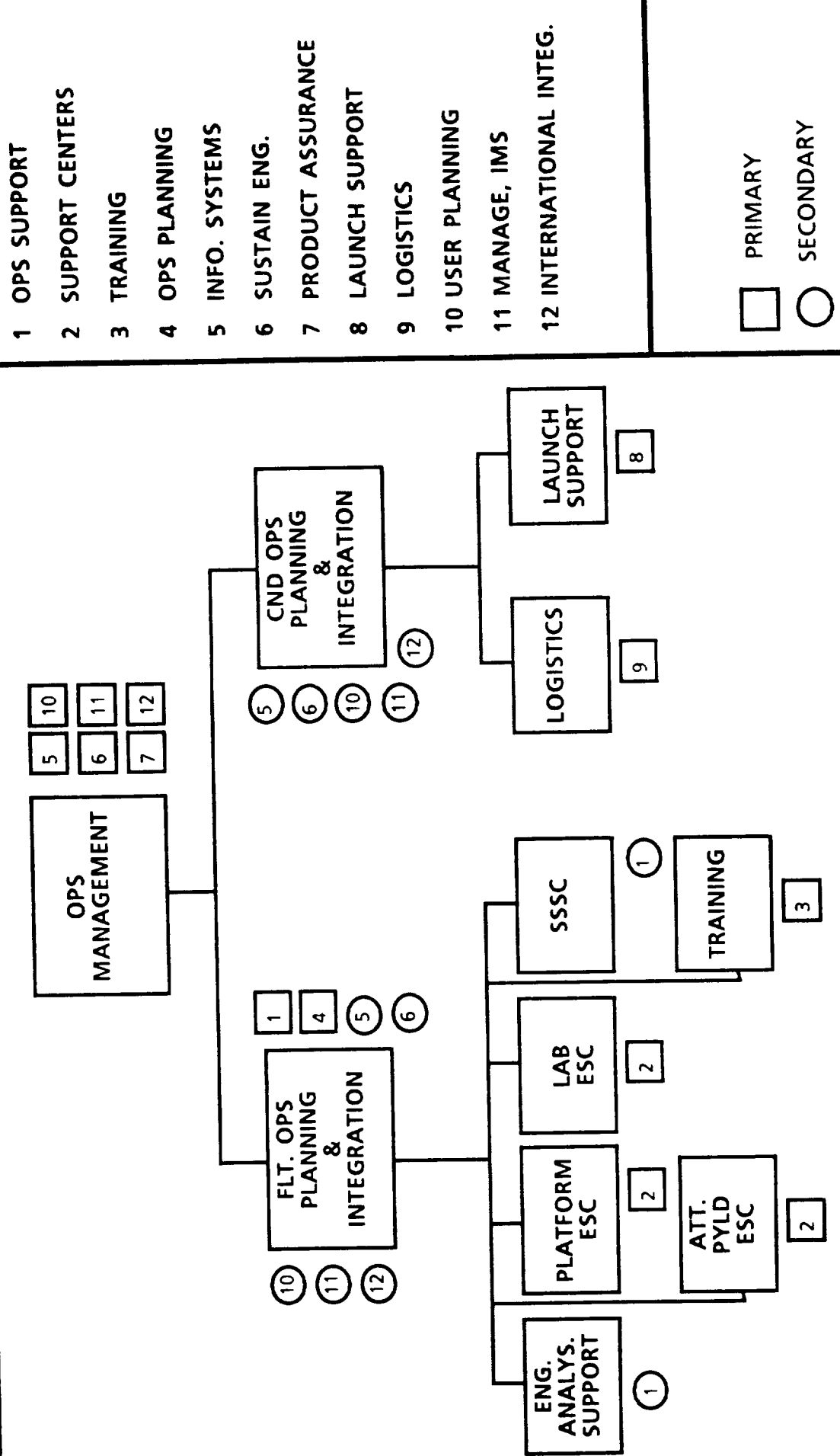
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- Approach was to perform “sanity check” on program developed costs
- Operations costs were submitted based on attached operations functions architecture
- Program costs were consistent with current OTF concepts with two exceptions:
  - User operations integration facility was not included - cost increase TBD
  - Payload/Station integration facilities were not centralized/consolidated - cost savings TBD
- OTF comments were incorporated in Cost Commitment Team presentation to Deputy Administrator on 1/22/87 - data is “restricted access”



# OPERATIONS FUNCTIONS ARCHITECTURE



## **OPERATIONS CONCEPT DEVELOPMENT APPROACH**

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- Define Space Station operations functions and establish most effective approach for function performance
  - User development and integration
  - Ground operations
  - On-orbit operations
- Define management scheme(s)/structure(s) for administering above functions
  - Direct user control and execution
  - Direct Station operator control and execution
  - User direction; Station operator execution support

**NOTE:** Each management scheme must allow International and Department of Defense participation

# MAJOR OPERATIONS FUNCTIONS

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## A. USER DEVELOPMENT AND INTEGRATION

- Station marketing/contracting
- User selection/resource allocation
- Manifest development
- Pricing

## B. GROUND OPERATIONS

- Logistics
- Sustaining engineering
- Transportation
- Pre-/post-flight operations

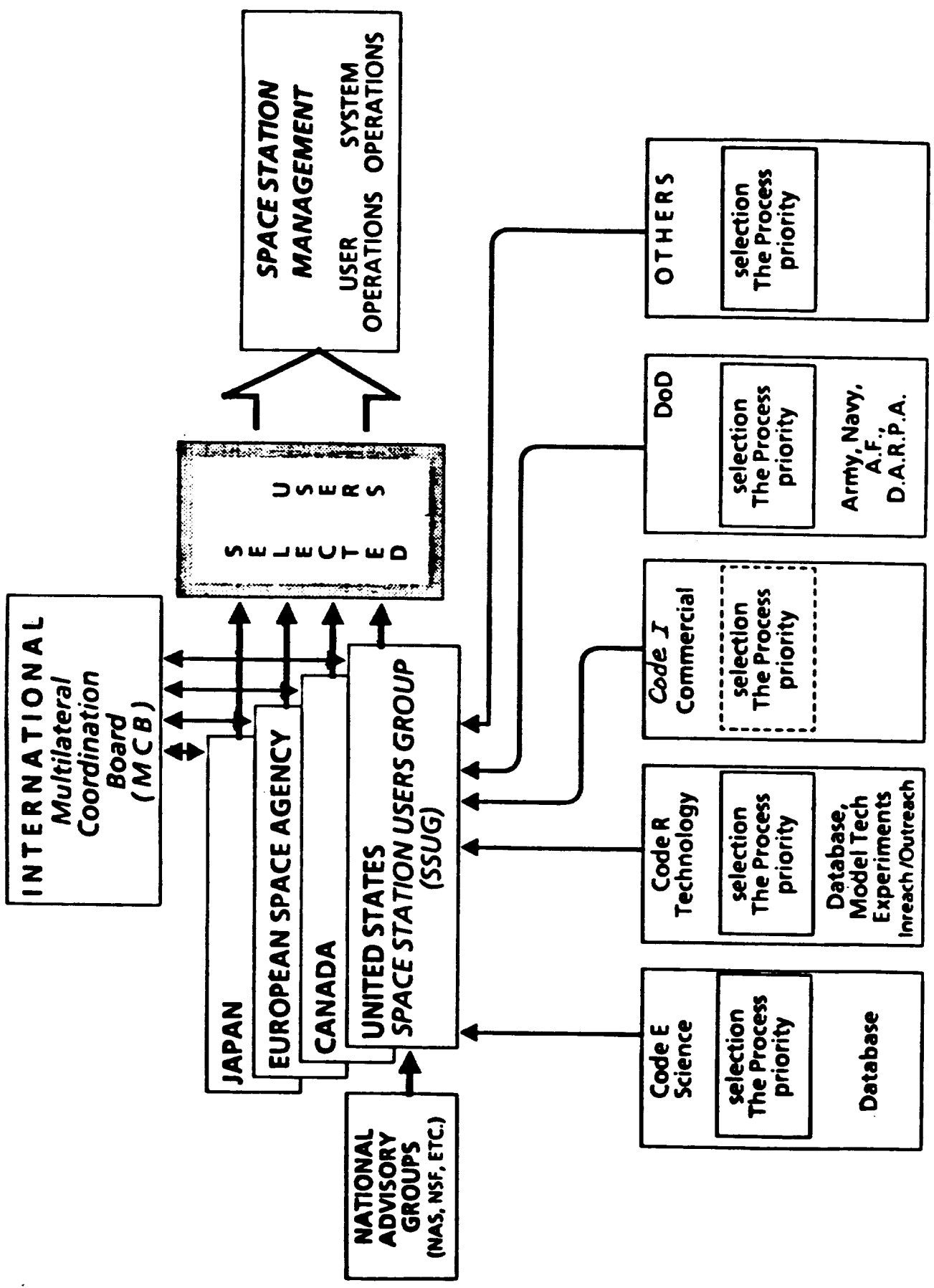
## C. ON-ORBIT OPERATIONS

- User operations
- Flight crew operations
- Station systems operations
- Data systems operations

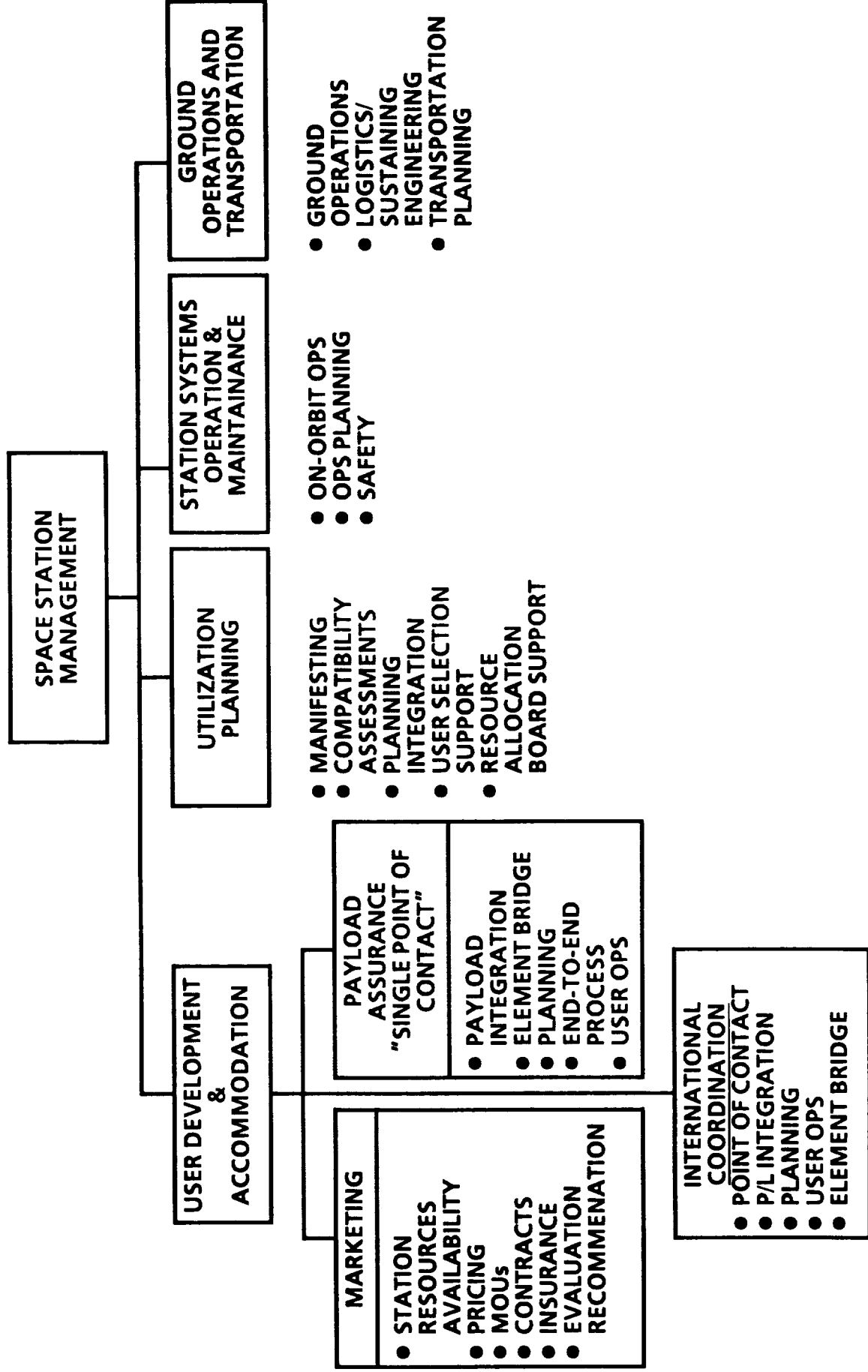
## **A.1 USER DEVELOPMENT & INTEGRATION USER SELECTION/ALLOCATION**

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- **“U.S. Space Station Users Board” is required to integrate U.S. user interests**
  - Presents U.S. at international partner level; negotiates “fair share” utilization
  - Comprised of major U.S. user group representatives
  - Communicates policy and allocates strategic Station resources to U.S. user groups
  - Collects “selected users” requirements and provides to Space Station operations
- **Individual users selected by SSUB user groups within allotted resources**
- **Open item:**
  - Reporting level of SSUB
    - NASA Deputy Administrator
    - Executive Branch outside NASA (i.e., to integrate Administration policies more directly)



DATA



## **A.2 USER DEVELOPMENT & INTEGRATION MANIFESTING**

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- **DEFINITION: MANIFESTING** - The fitting of user and Station support requirements to the available capabilities of onboard, ground, and transportation resources over a specified period of time
- Space Station manifest is the top-level utilization plan for the Space Station, its users, operators, and transportation suppliers
- Developed, maintained, and controlled by the Space Station Operations Organization in support of Space Station User's Board U.S. and international requirements
- Contains all information
  - Needed by users to plan, budget, and otherwise coordinate their use of Space Station
  - Needed to direct Space Station operations planning
  - Needed by transportation (e.g., STS, ELV's) to plan support

## **A.2 USER DEVELOPMENT & INTEGRATION MANIFESTING (CONTINUED)**

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- Four options for performing this function are under evaluation
  1. “Traditional” centralized “STS-like” manifesting office at Headquarters with technical support from Centers
  2. Distributed “specialty” manifests for logistics, Station systems operations, and users with integration by Headquarters staff
  3. Distributed “element” manifests by international partners with integration by Headquarters staff
  4. Total manifesting by tactical operations group supported by distributed element operations
- Option 1 is preferred through assembly, checkout, and verification; Option 2 for mature operations



## **A.3 USER DEVELOPMENT & INTEGRATION MARKETING**

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- Outreach and market development will be crucial to full utilization of Station
- Marketing strategy should be based on total inventory of available NASA assets (e.g., Station, STS, ELV's, etc.)
- Three implementation options under evaluation
  1. Single NASA Headquarters organization for all NASA Outreach and marketing
    - a) Office develops plans and initiates user contact with follow-up by appropriate Program Office technical support; or
    - b) Office develops plans and contracts for user support with technical support by appropriate Program Office
  2. Space Station provides own Outreach and implements through a Station marketing office; with or without contractor assistance
  3. Space Station (or Headquarters) packages "resource envelopes" designated for commercial, science, DOD, etc. (consistent with policy), sells to high bidder who, in turn, markets for profit (i.e., no marketing by NASA)
- Recommendation: TBD

## **A.4 USER DEVELOPMENT & INTEGRATION PRICING**

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- **Two key options exist for Station pricing**
  1. Recover costs of supplying services to non-NASA users
  2. Promote more efficient use of Station resources
- **Cost recovery typically means:**
  - Posted prices
  - Simplified resource packaging (e.g., STS uses payload bay volume/weight as price "leaders")
  - NASA users received budget allocation or receive free service (Station absorbs cost)
  - Other users pay
- **Efficient use typically means:**
  - Station resources allocated to user groups based on national/agency policies
  - User groups "sell" to outside users or barter among themselves -- market demand determines price

## **A.4 USER DEVELOPMENT & INTEGRATION PRICING (CONTINUED)**

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- Resources are not extensively packaged; user pays for what he uses
  - Requires resource usage "metering"
- Possibly uneven pricing among commercial and science users -- requires "feedback adjustment" of user group allocations
- Task Force pricing specialists recommend Option 2; final recommendation is TBD
- Option 2 does not appear to be compatible with "international Space Station" accounting requirements (i.e., everyone pays same price)

# MAJOR OPERATIONS FUNCTIONS

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## A. USER DEVELOPMENT AND INTEGRATION

- Station marketing/contracting
- User selection/resource allocation
- Manifest development
- Pricing

## B. GROUND OPERATIONS

- Logistics
- Sustaining engineering
- Transportation
- Pre-/post-flight operations

## C. ON-ORBIT OPERATIONS

- User operations
- Flight crew operations
- Station systems operations
- Data systems operations

## **B.1 GROUND OPERATIONS LOGISTICS**

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- **Must include, in an integrated manner, all aspects of**
  - Maintenance planning (in concert with on-orbit operations)
  - Spares
  - Resupply support
  - Test and support equipment/facilities
  - Transportation/handling
- **Function should receive more emphasis during acquisition phase (increased advocacy strength at all program levels)**
- **Open items:**
  - In-plant versus organic maintenance
  - On-orbit responsibilities (i.e., synergism with Station systems support)

## **B.2 GROUND OPERATIONS SUSTAINING ENGINEERING**

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- Single organization for all U.S. flight sustaining engineering support in mature operations
- Should be co-located with logistics (maintenance) function
- Supports Station/payload integration
- Supports on-orbit operations through consultation
- Open items:
  - Transition from distributed design engineering support to single contractor
  - International sustaining engineering plans

## **B.3 GROUND OPERATIONS TRANSPORTATION**

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- STS - obtained via Code M or equivalent organization
- ELV - TBD
- Ground transportation - supplied by user to launch site; at launch site, supplied by Station or STS for STS launch; ELV for ELV launch

## **B.4 GROUND OPERATIONS PRE-/POST-FLIGHT OPERATIONS**

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- Experiment integration
  - Rack "buildup" - user facility
  - Rack to Station - KSC integration facility
- "Simple" interfaces to Station - "Ship and Shoot"
- Rack "suitcase simulators" supplied to users
- Large scale integration facility operated by KSC in "host" mode; development centers participate in verification
- "Telecheckout" concept supported
- Users of international modules are integrated via that partner's processes
- Open items:
  - International integration plans



# MAJOR OPERATIONS FUNCTIONS

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## A. USER DEVELOPMENT AND INTEGRATION

- Station marketing/contracting
- User selection/resource allocation
- Manifest development
- Pricing

## B. GROUND OPERATIONS

- Logistics
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- Transportation
- Pre-/post-flight operations

## C. ON-ORBIT OPERATIONS

- User operations
- Flight crew operations
- Station systems operations
- Data systems operations

## **C.1 ON-ORBIT OPERATIONS USERS**

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- **Widely distributed user operations execution process is permitted - goals of "telescope operations" are embraced**
- **User autonomy/flexibility within prescribed "resources performance envelopes" is permitted**
- **A user-directed "user operations integration" function is required (planning and execution)**
  - **User requirements integration**
  - **Interface to Station systems support function**
  - **Allocation of "experiment resource performance envelopes"**
- **Station systems support function allocates Station resources between "Station" and "users" at utilization element level - Program Manager resolves conflicts**
- **Distributed user support to "user operations integration" function is best performed at the discipline level, suggesting "nodes of user operation specialization"**

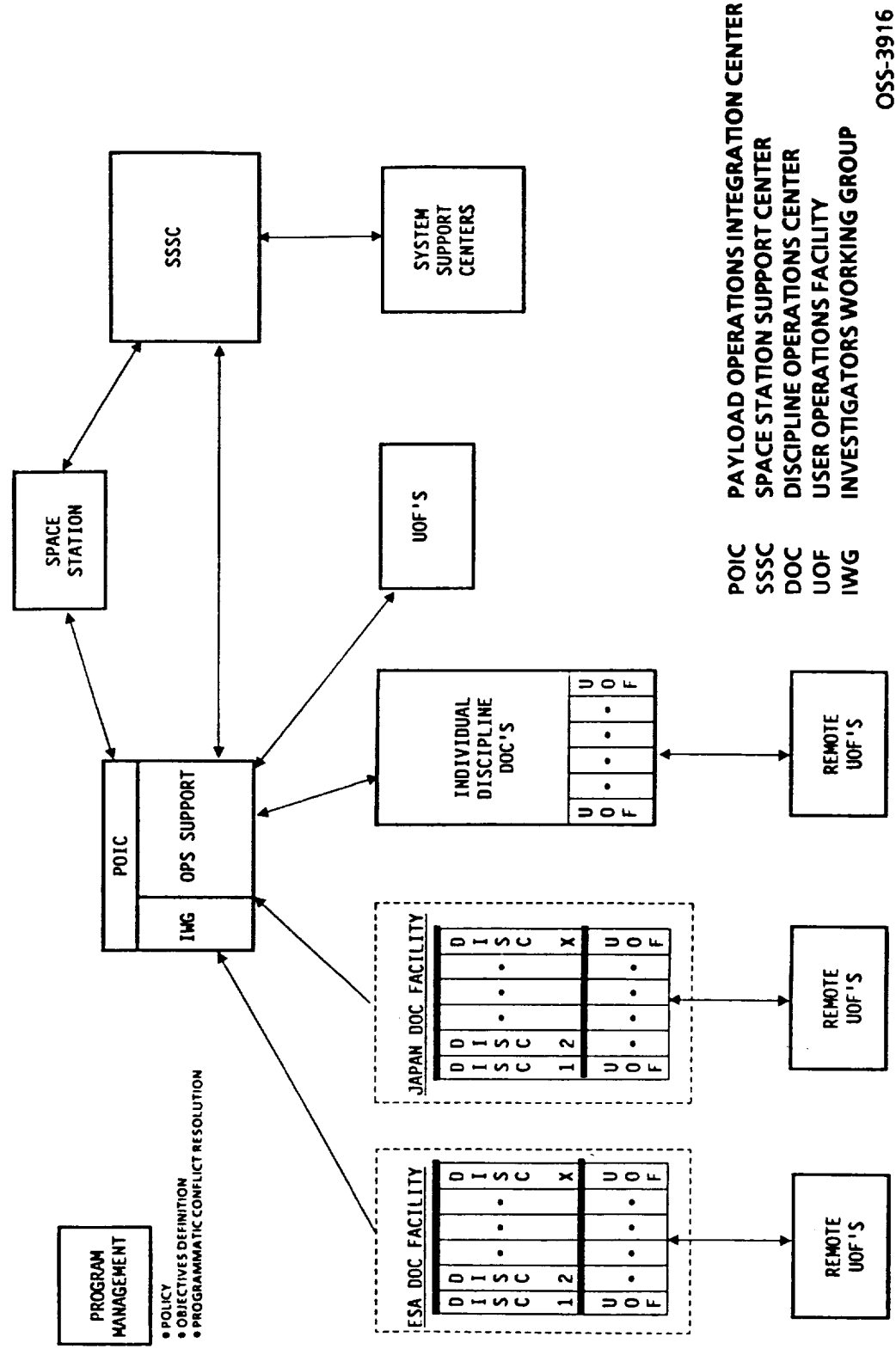
## **C.1 ON-ORBIT OPERATIONS USERS (CONTINUED)**

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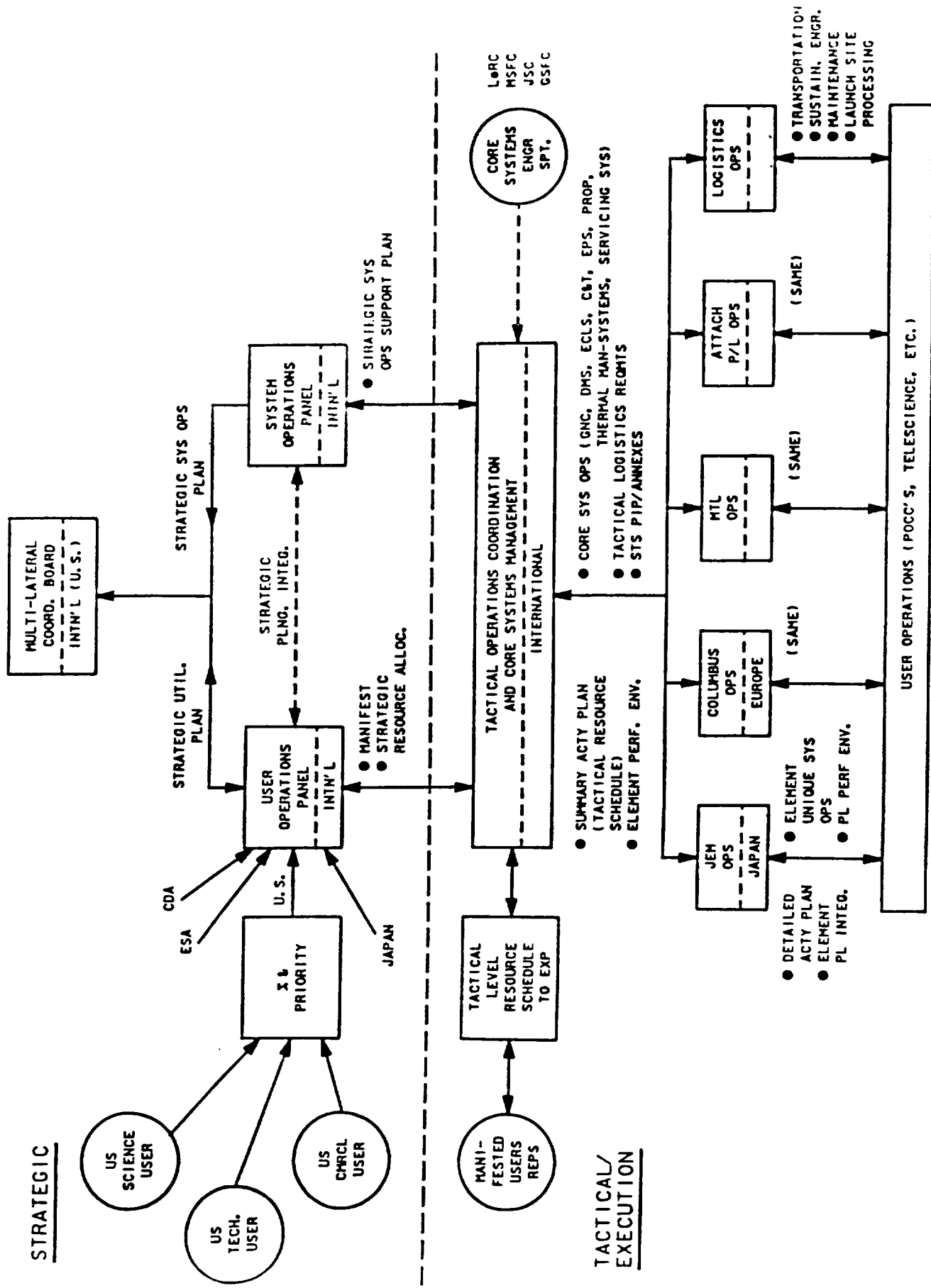
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- Crew operations is “integrated;” no “element-dedicated” crews (see flight crew operations)
- Platform user operations are analogous but separate from manned base operations - current program plan to locate these at GSFC is acceptable
- Open items:
  - Location of “user operations integration” function (co-located with or remote from Station systems support function)
  - International acceptance

# SPACE STATION OPERATIONS



# SPACE STATION OPERATIONS (MANNED-BASE)



## INTERNATIONAL OPERATIONS

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- SSOTF principles in dealing with internationals are:
  - Strategic and tactical planning for the SS utilization shall be integrated with all partners participating in the planning process. Fair share allocations of SS resources will be made
  - Inflight activities will be carried out by an integrated crew consistent with U.S. responsibilities for safety
  - Ground support, as necessary, will be provided in an integrated manner under overall control of the United States. Certain non-safety element functions will be distributed among the partners

## **C.2 ON-ORBIT OPERATIONS STATION SYSTEMS**

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- **Centralized Station systems support function is required**
  - Configuration, performance management, and maintenance of core systems
    - Data Mgmt Sys
    - ECLS
    - Electrical Power
    - GNC
    - Servicing Systems
    - EVA Support
    - Comm & Tracking
    - Propulsion
    - Thermal
    - Man-systems
    - OMV
  - STS/TDRS support interfaces
  - Focus support to user operations integration function - perform tactical operations planning integration
- **In-depth engineering flight analysis support by development centers initially; transition to sustaining engineering later**
- **Non-safety, "element-unique" systems support can be distributed if shown to be cost-effective**
- **Flight crew is "integrated;" no "element-dedicated" crews (see flight crew operations)**

## **C.2 ON-ORBIT OPERATIONS STATION SYSTEMS (CONTINUED)**

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- Platform systems operations are analagous but separate from manned base operations - current program plan to locate these at GSFC is acceptable
- Open items:
  - Location of systems support function
    - Co-location with user oeprations integration
    - Co-location with STS user operations function
    - Co-location with Station sustaining engineering/logistics function
  - International acceptance
    - Japan, Canada seem in agreement
    - ESA - TBD



## C.3 ON-ORBIT OPERATIONS FLIGHT CREW

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- Safe operations required a recognized command structure and a team approach to operations

- Three types of crew persons

Station Operators      ● Station Systems Manager, Systems Maintenance Engineer, EVA

- Selected by Station operator

Station Scientists

- Career Astronaut, competent scientist, flies as a generalist, qualified Station systems operator, EVA, supports user payload integration

- Nominated by users; selected by Station operator

Payload Scientist

- Payload generalist or specialist as desired by users
  - no systems hazardous operations - may conduct experiment operations with safety bounds - no EVA
- Selected by users

- Commander selected for each mission increment by Station from Station operator or Station scientist Astronaut cadre

-- Commander is responsible for safety and the provision of user operations opportunities, but not science objectives

## **C.3 ON-ORBIT OPERATIONS FLIGHT CREW (CONTINUED)**

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- **Station Astronaut Office of Station operators and Station scientists affiliated with STS Astronaut Office**
  - Absorb culture of safe and competent systems operations
  - Synergism in procedures development for EVA, prox ops, OMV control, manipulator operations, fuel transfer, etc.
  - Combined operations training (e.g., resupply visit)
  - Opportunity for STS flight experience as STS Mission Specialists
- **Internationals may select payload scientist similar to U.S. user organizations**
- **Internationals may provide Station operator and Station scientist candidates for NASA selection**
- **Undesirable to fly "non-contributing" persons**
  - Station Operator/Scientist training - 3 years + 18 months of flight specific
  - Payload Scientist training - 18 months of flight specific
- **Open items**
  - International acceptance - ESA (and possibly Japan) wants all-purpose crew persons dedicated by element

## **C.4 ON-ORBIT OPERATIONS DATA SYSTEMS**

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- Embraces transaction management, resource allocation versus command checking in support of telescience
- Supports gradual migration of operations automation from ground to on-board (e.g., phased OMS implementation)
- Supports autonomous element operations versus global control
- Supports interoperability of SSIS, TMIS, and SSE systems (maximizes commonality of hardware and software)
- Supports CCSDS packet switching network technology

## **FUTURE ACTIVITIES**

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- **INTERNATIONAL MEETINGS**
- **NASA HEADQUARTERS REORGANIZATION**
- **TFSUSS REVIEW**
- **SCHEDULE**



SPACE STATION  
OPERATIONS  
TASK FORCE

# SCHEDULE

SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
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ORGANIZATION

ORIENTATION

PANEL STUDIES

INDUSTRY BRIEFINGS

INTEGRATION & REPORT WRITING

INTERNATIONAL  
MEETINGS

IOCWG  
MEETING

ESA  
11/20&21

JAPAN  
12/4&5

CANADA  
12/3

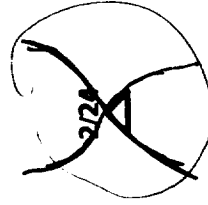
2/10-12

OVERSIGHT  
COMMITTEE

11/14

12/16

1/28



INDUSTRY  
BRIEFINGS

12/2

PRE BRIEFING  
CONFERENCE

BRIEFINGS

PANEL  
PRESENTATION

Panel 3  
17-20

Panel 2  
2-6

Panel 1  
23-27

PRODUCTS

DRAFT  
PRODUCT  
FOR MOU  
11/12

RFP  
INPUT 12/17

COST  
ASSESSMENT

OPERATIONS  
CONCEPT

OSS-2632  
1/28/87